

## **VOLUTE INLET OF FAN**

### **FIELD OF THE INVENTION**

The present invention relates to cooling devices and more particularly to a volute inlet of fan with 5 improved heat dissipation characteristic.

### **DESCRIPTION OF RELATED ART**

The improvements of computer components are continuous. Also, heat generated by running computer components is increased. This is particularly true for 10 a CPU (central processing unit) and data storage components (e.g., hard disk). It is understood that the normal operation of a computer will be adversely affected or even the computer will be broken down if accumulated heat is not dissipated sufficiently. As 15 such, well heat dissipation is critical for the constant development of computers. A heat dissipation device of computer is either liquid cooled or air cooled type. Also, fan is the most important element of the heat dissipation device of either type. This is particularly 20 true for notebook computer or 1U server. However, the increase of the number of fans is limited or even impossible due to the narrow internal space of the computer or the 1U server. Hence, the only way to increase the heat dissipation capability of computer is 25 to increase the efficiency of fan.

A prior eccentric fan disclosed an inlet and blades at positions other than center thereof. As known that introduced air will cause turbulence due to collision with three sidewalls (other than inlet) of the housing 5 of fan. This will decrease the speed of the set up current of air and thus will decrease efficiency. As such, the above eccentric configuration aims at decreasing the turbulence and thus increases the efficiency of fan.

10 However, the prior eccentric design requires a larger space for accommodating components of the fan. This contradicts the trend of downsizing of modern electrical and/or electronic products. The space between the blades of fan and the three sidewalls of 15 the housing is from the maximum to the minimum, but an area of the inlet is equal to an area of the blades. Moreover, turbulence still cannot be completely eliminated due to the collision of the set up current of air with sidewalls of the housing. As a result, the 20 purpose of increasing the heat dissipation capability of fan is not achieved. Thus, the need for improvement still exists.

#### **SUMMARY OF THE INVENTION**

It is an object of the present invention to provide a 25 fan for cooling an electronic device without modifying

a housing of the fan. Instead, the fan is designed to have a volute inlet rather than a circular one to partially cover blades by adapting to the direction of the introduced air. The inlet has a reference point on 5 the housing with respect to an outlet. The blades are partially covered by the inlet from the reference point wherein an area of the blades covered by the inlet is from a maximum to a minimum gradually in a closed loop. As a result, the set up current of air can reach a 10 maximum prior to output from the outlet, thereby increasing the heat dissipation capability of the fan.

The above and other objects, features and advantages of the present invention will become apparent from the following detailed description taken 15 with the accompanying drawings.

#### **BRIEF DESCRIPTION OF THE DRAWINGS**

FIG. 1 is a perspective view of a first preferred embodiment of fan incorporating a volute inlet according to the invention;

20 FIG. 2 is an exploded view of FIG. 1;

FIG. 3 is a top plan view of FIG. 1;

FIG. 4 is a perspective view of a second preferred embodiment of fan incorporating a volute inlet according to the invention;

25 FIG. 5 is an exploded view of FIG. 4; and

FIG. 6 is a top plan view of FIG. 4.

**DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS**

Referring to FIGS. 1 and 2, there is shown a first  
5 preferred embodiment of fan 10 in accordance with  
the invention. The fan 10 has an improved inlet 13 for  
increasing heat dissipation capability thereof as  
detailed below. The inlet has a shape started from a  
reference point 131 with respect to an outlet 14.

10 Blades 12 are partially covered by the inlet 13 from  
the reference point 131 in which the covered area of  
blades is from a maximum to a minimum gradually in  
a closed loop. This forms a volute inlet rather than a  
circular inlet 13.

15 The fan 10 is implemented as a centrifugal fan  
and comprises a housing 11, a plurality of blades 12  
rotatably supported by a shaft, an inlet 13 is on a two  
sides of the housing 11, and a side outlet 14. The inlet  
13 is either concentric or eccentric with respect to the  
20 housing 11. Also, the shaft of the blades 12 is located  
at a center of the inlet 13.

Referring to FIG. 3, the inlet 13 is substantially  
divided into four quarters. The first quarter begins at  
the reference point 131 in which an area of the blades  
25 12 covered by the first quarter of the inlet 13 is a

maximum as indicated by dashed lines. As such, the amount of introduced air per unit time will be decreased and thus the air compression ratio will be increased. Consequently, in the second quarter the 5 amount of introduced air per unit time will be increased slightly as the area of the blades 12 covered by the second quarter is decreased. As such, the current of air will be further compressed. In the third quarter, more air is introduced into the housing 11 and 10 thus the current of air will be still further compressed. In the fourth quarter, the covered area of the blades 12 is a minimum and the set up current of air reaches a maximum prior to output from the outlet 14. As a result, a component facing the outlet 14 will be 15 sufficiently cooled.

Note that a reverse current of air will be generated if the component is very proximate the outlet 14. Also, a reverse current of air will be also generated if the suction effect in the third quarter is large enough due 20 to the quick expansion of low pressure air. Advantageously, the invention can overcome the above adverse factors. Moreover, the volute shape of the inlet 13 can increase the set up current of air by increasing a pressure difference between the inlet 13 25 and the outlet 14. Thus, more driving power is

transmitted to the shaft. This in turn will increase the efficiency of the fan 10 by increasing the heat dissipation capability thereof. In addition, noise generated during operation can be significantly 5 reduced.

Referring to FIGS. 4 to 6, there is shown a second preferred embodiment of fan 10' in accordance with the invention. The second preferred embodiment substantially has same structure as the first preferred 10 embodiment. The only difference between the first and the second preferred embodiments is the housing 11' having a shape different from the housing 11. The second preferred embodiment aims at accommodating the fan of the invention to different interior space of 15 an electronic device.

While the invention herein disclosed has been described by means of specific embodiments, numerous modifications and variations could be made thereto by those skilled in the art without departing 20 from the scope and spirit of the invention set forth in the claims.